AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application. The following listing provides the amended claims with the amendments marked with deleted material crossed out and new material underlined to show the changes made.

1. (Currently Amended) A method of processing ~~a video sequence comprised of~~ a plurality of frames to determine a number of bidirectional motion compensated (B) frames to be encoded in a set of successive frames in the plurality of frames, the method comprising:

a) computing motion vectors for at least one frame in the set of successive frames, wherein the computed motion vectors for each particular frame are based only on the particular frame and a preceding frame;

b) determining a motion cost value for at least one frame in the set of successive frames;

c) determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

d) determining the number of B-frames to be encoded in the set of successive frames based on the derived cost value.

2. (Currently Amended) The method of claim 1, wherein the motion cost value of a frame is related to ~~the~~ a number of bits required to encode the motion vectors of the frame.

3. (Original) The method of claim 2 further comprising, after step a) and before step b):

computing motion compensation errors (MCEs) for at least one frame in the set of successive frames, wherein the motion cost value of a frame is related to the number of bits required to encode the motion vectors and the MCEs of the frame.

4. (Original) The method of claim 1 wherein:

step b) comprises determining a motion cost value for a first and second frame in the set of successive frames; and

the derived cost value is the average of the motion cost values for the first and second frames.

5. (Original) The method of claim 1 wherein:

step b) comprises determining a motion cost value for a first and second frame in the set of successive frames; and

the derived cost value is a ratio between the motion cost value of the first frame and the motion cost value of the second frame.

6. (Currently Amended) A method of processing a plurality of frames to determine a number of bidirectional motion compensated (B) frames to be encoded in a set of successive frames in the plurality of frames, the method comprising:

a) computing motion vectors for at least one frame in the set of successive frames;

b) determining a motion cost value for at least one frame in the set of successive frames;

c) determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

d) determining the number of B-frames to be encoded in the set of successive frames based on the derived cost value by ~~The method of claim 1 wherein step d) comprises~~ comparing the derived cost value to a predetermined threshold value to determine the number of B-frames to be encoded in the set of successive frames, wherein the number of B-frames to be encoded increases as long as the derived cost value is below the predetermined threshold value.

7. (Original) The method of claim 6 wherein the predetermined threshold value varies as the number of B-frames to be encoded increases.

8. (Currently Amended) A method of encoding a video sequence in two passes, the video sequence comprising ~~being comprised of~~ a plurality of frames, the method comprising:

a) performing a first pass of operations on a set of successive frames of the plurality of frames, the first pass of operations comprising:

computing motion vectors for at least one frame in the set of successive frames, wherein the computed motion vectors for each particular frame are based only on the particular frame and a preceding frame;

determining a motion cost value for at least one frame in the set of successive frames;

determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

determining a number of bidirectional motion compensated (B) frames to be encoded in the set of successive frames based on the derived cost value; and

b) performing a second pass of operations on the set of successive frames, the second pass of operations comprising:

encoding the determined number of frames in the set of successive frames as B-frames by using at least one motion vector computed in the first pass of operations ~~step a).~~

Claims 9-11. (Canceled)

12. (Currently Amended) A method of encoding a video sequence in two passes, the video sequence comprising a plurality of frames, the method comprising:

a) performing a first pass of operations on a set of successive frames of the plurality of frames, the first pass of operations comprising:

computing motion vectors for at least one frame in the set of successive frames, wherein computing motion vectors ~~The method of claim 8, wherein step a)~~ comprises computing motion vectors for a first and second frame in the set of successive frames, the motion vectors for the first frame being computed using information from a preceding frame and the motion vectors for the second frame being computed using information from the same preceding frame;

determining a motion cost value for at least one frame in the set of successive frames;

determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

determining a number of bidirectional motion compensated (B) frames to be encoded in the set of successive frames based on the derived cost value; and

b) performing a second pass of operations on the set of successive frames, the second pass of operations comprising:

encoding the determined number of frames in the set of successive frames as B-frames by using at least one motion vector computed in the first pass of operations.

13. (Original) The method of claim 12 wherein all of the motion vectors computed in step a) are used in step b).

14. (Currently Amended) The method of claim 8, wherein step b) further comprises encoding the next frame in the set of successive frames after the B-frames as a unidirectional motion compensated (P) frame ~~a P-frame~~.

15. (Currently Amended) A method of detecting scene cuts in a video sequence comprised of a plurality of frames, the method comprising:

a) computing motion vectors for a first frame and a second frame in the plurality of frames;

b) determining a motion cost value for the computed motion vectors of the first frame and the second frame;

c) determining a ratio between the motion cost value for the computed motion vectors of the first frame and the motion cost value for the computed motion vectors of the second frame; and

d) determining if there is a scene cut between the first frame and the second frames based on the ratio.

16. (Original) The method of claim 15 wherein a scene cut is a point in time when the content in the video sequence is discontinuous.

17. (Currently Amended) The method of claim 15, wherein the motion cost value for the computed motion vectors of the first frame is related to a ~~the~~ number of bits required to encode the motion vectors of the first frame and the motion cost value for the computed motion vectors of the second frame is related to a ~~the~~ number of bits required to encode the motion vectors of the second frame.

18. (Currently Amended) A method of detecting scene cuts in a video sequence comprised of a plurality of frames, the method comprising:

a) computing motion vectors for a first frame and a second frame in the plurality of frames;

b) determining a motion cost value for the first frame and the second frame;

c) determining a ratio between the motion cost value of the first frame and the motion cost value of the second frame; and

d) determining if there is a scene cut between the first frame and the second frames based on the ratio by ~~The method of claim 15, wherein step d) comprises~~ determining if the ratio is less than a predetermined threshold value.

19. (Currently Amended) The method of claim 18, wherein the second frame is a frame immediately preceding the first frame in the plurality of frames.

20. (Original) The method of claim 19 further comprising:

e) marking the first frame as a frame immediately after a scene cut and the second frame as a frame immediately before the scene cut if it is determined that the ratio is not less than a predetermined threshold value.

21. (Currently Amended) A ~~computer program product having a~~ computer readable medium storing a ~~having~~ computer program ~~instructions recorded thereon~~ for processing a video sequence ~~comprised of~~ comprising a plurality of frames to determine a number of bidirectional motion compensated (B) frames to be encoded in a set of successive frames in the plurality of frames, the computer program executable by at least one processor, the computer program comprising sets of instructions for ~~product comprising~~:

~~instructions for~~ computing motion vectors for at least one frame in the set of successive frames, wherein the computed motion vectors for each particular frame are based only on the particular frame and a preceding frame;

~~instructions for~~ determining a motion cost value for at least one frame in the set of successive frames;

~~instructions for~~ determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

~~instructions for~~ determining the number of B-frames to be encoded in the set of successive frames based on the derived cost value.

22. (Currently Amended) The computer readable medium ~~program product~~ of claim 21, wherein the motion cost value of a frame is related to a ~~the~~ number of bits required to encode the motion vectors of the frame.

23. (Currently Amended) The computer readable medium ~~program product~~ of claim 21, wherein:

the set of instructions for determining a motion cost value for at least one frame in the set of successive frames comprises a set of instructions for determining a motion cost value for a first and second frame in the set of successive frames; and

the derived cost value is a ratio between the motion cost value of the first frame and the motion cost value of the second frame.

24. (Currently Amended) A computer readable medium storing a computer program for processing a video sequence comprising a plurality of frames to determine a number of bidirectional motion compensated (B) frames to be encoded in a set of successive frames in the plurality of frames, the computer program executable by at least one processor, the computer program comprising sets of instructions for:

computing motion vectors for at least one frame in the set of successive frames;

determining a motion cost value for at least one frame in the set of successive frames;

determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

determining the number of B-frames to be encoded in the set of successive frames based on the derived cost value by ~~The computer program product of claim 21, wherein the set of instructions for determining the number of B-frames comprises a set of instructions for~~ comparing the derived cost value to a predetermined threshold value to determine the number of B-frames to be encoded in the set of successive frames, wherein the number of B-frames to be encoded increases as long as the derived cost value is below the predetermined threshold value.

25. (Currently Amended) A ~~computer program product having a~~ computer readable medium storing a ~~having~~ computer program ~~instructions recorded thereon~~ for encoding a video sequence in two passes, the video sequence comprising ~~being comprised of~~ a plurality of frames, the computer program executable by at least one processor, the computer program comprising sets of instructions for ~~product comprising~~:

~~instructions for~~ performing a first pass of operations on a set of successive frames of the plurality of frames, ~~the instructions for~~ wherein performing the first pass of operations ~~comprising~~ comprises:

~~instructions for~~ computing motion vectors for at least one frame in the set of successive frames, wherein the computed motion vectors for each particular frame are based only on the particular frame and a preceding frame;

~~instructions for~~ determining a motion cost value for at least one frame in the set of successive frames;

~~instructions for~~ determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

~~instructions for~~ determining a number of bidirectional motion compensated (B) frames to be encoded in the set of successive frames based on the derived cost value; and

~~instructions for~~ performing a second pass of operations on the set of successive frames, ~~the instructions for~~ wherein performing the second pass of operations comprises ~~comprising: instructions for~~ encoding the determined number of frames in the set of successive frames as B-frames by using at least one motion vector computed by ~~instructions~~ performing the first pass of operations.

26. (Canceled)

27. (Currently Amended) A computer readable medium storing a computer program for encoding a video sequence in two passes, the video sequence comprising a plurality of frames, the computer program executable by at least one processor, the computer program comprising sets of instructions for:

performing a first pass of operations on a set of successive frames of the plurality of frames, wherein performing the first pass of operations comprises:

computing motion vectors for at least one frame in the set of successive frames, wherein computing motion vectors comprises ~~The computer program product of claim 25, wherein the instructions for computing motion vectors comprises instructions for~~ computing motion vectors for a first and second frame in the set of successive frames, the motion vectors for the first frame being computed using information from a preceding frame and the motion vectors for the second frame being computed using information from the same preceding frame;

determining a motion cost value for at least one frame in the set of successive frames;

determining a derived cost value based on the motion cost value for at least one frame in the set of successive frames; and

determining a number of bidirectional motion compensated (B) frames to be encoded in the set of successive frames based on the derived cost value; and

performing a second pass of operations on the set of successive frames, wherein performing the second pass of operations comprises encoding the determined number of frames in the set of successive frames as B-frames by using at least one motion vector computed by performing the first pass of operations.

28. (Currently Amended) The computer readable medium ~~program product~~ of claim 25, wherein all of the motion vectors computed by ~~the instructions~~ performing the first pass of operations are used by ~~the instructions~~ performing the second pass of operations.

29. (Currently Amended) A ~~computer program product having a~~ computer readable medium storing a ~~having~~ computer program ~~instructions recorded thereon~~ for detecting scene cuts in a video sequence comprised of a plurality of frames, the computer program executable by at least one processor, the computer program comprising sets of instructions for ~~product comprising~~:

~~instructions for~~ computing motion vectors for a first frame and a second frame in the plurality of frames;

~~instructions for~~ determining a motion cost value for the computed motion vectors of the first frame and the second frame;

~~instructions for~~ determining a ratio between the motion cost value for the computed motion vectors of the first frame and the motion cost value for the computed motion vectors of the second frame; and

~~instructions for~~ determining if there is a scene cut between the first frame and the second frame based on the ratio.

30. (Canceled)

31. (New) A method for processing a sequence of video pictures, the method comprising:

a) determining a number of bidirectional motion compensated (B) video pictures for the sequence of video pictures based on a cost value associated with motion vectors that are based only on a particular video picture and a preceding video picture; and

b) encoding the sequence of video pictures using the determined number of B-video pictures.

32. (New) The method of claim 31, wherein determining the number of B-video pictures comprises:

a) computing at least one motion vector for at least one video picture in the sequence of video pictures;

b) computing a cost value for at least one computed motion vector; and

c) determining whether the cost value is greater than a threshold value to determine the number of B-video pictures.

33. (New) The method of claim 32 further comprising iteratively (a) computing at least one motion vector, (b) computing the cost value and (c) determining whether the cost value is greater than the threshold value, wherein the number of B-video pictures is a number of video pictures between the particular video picture and a reference video picture, wherein the particular video picture is a video picture that comprises a particular cost value that causes the cost value to be greater than the threshold value.

34. (New) The method of claim 32, wherein the cost value comprises a bit value for encoding the computed motion vector.

35. (New) The method of claim 32, wherein encoding the sequence comprises using at least one of the computed motion vectors.

36. (New) The method of claim 35, wherein the preceding video picture is a video picture that is immediately preceding the particular video picture.

37. (New) The method of claim 32, wherein encoding the sequence comprises using all of the computed motion vectors.

38. (New) The method of claim 37, wherein the preceding video picture is an I-video picture preceding the particular video picture.

39. (New) The method of claim 31 further comprising:

a) determining a relationship between a motion vector cost value for a first video picture and a motion vector cost value for a second video picture; and

b) determining whether there is a scene cut between the first video picture and the second video picture based on the relationship.

40. (New) A method for processing a sequence of video pictures, the method comprising:

a) encoding a plurality of video pictures as unidirectional motion compensated (P) video pictures;

b) determining a number of B-video pictures for the sequence of video pictures based on a cost value associated with the P-video pictures; and

c) encoding the sequence of video pictures using the determined number of B-video pictures.

41. (New) The method of claim 40, wherein the sequence of video pictures that is encoded is the plurality of video pictures before being encoded as P-video pictures.

42. (New) The method of claim 40, wherein encoding the plurality of video pictures as P-video pictures and determining the number of B-video pictures are performed in a first pass

operation, wherein encoding the sequence of video pictures using the number of B-video pictures is performed in a second pass operation.

43. (New) The method of claim 42, wherein the first pass operation is performed iteratively for more than one video picture.

44. (New) The method of claim 40, wherein determining the number of B-video pictures comprises determining whether the cost value is greater than a threshold value, wherein when the cost value is greater than a threshold value, the number of B-video pictures is the number of video pictures between the particular video picture and a reference video picture.

45. (New) The method of claim 40, wherein the cost value is based on motion vectors for at least two video pictures in the sequence of video pictures.

46. (New) A method comprising:

a) determining a relationship between a motion vector cost value for a first video picture and a motion vector cost value for a second video picture; and

b) determining whether there is a scene cut between the first video picture and the second video picture based on the relationship.

47. (New) The method of claim 46, wherein determining whether there is the scene cut comprises determining whether the relationship is less than a predetermined threshold value.

48. (New) The method of claim 47, wherein the relationship is a ratio between the motion vector cost value for the first video picture and the motion vector cost value for the second video picture.

49. (New) The method of claim 48 further comprising determining there is the scene cut when the ratio is not less than the predetermined threshold value.

50. (New) The method of claim 49 further comprising marking a particular video picture as a video picture after the scene cut.

51. (New) The method of claim 50, wherein marking the particular video picture comprises marking the particular video picture as an I-video picture.

52. (New) A computer readable medium storing a computer program for processing a sequence of video pictures, the computer program executable by at least one processor, the computer program comprising sets of instructions for:

a) determining a number of bidirectional motion compensated (B) video pictures for the sequence of video pictures based on a cost value associated with motion vectors that are based only on a particular video picture and a preceding video picture; and

b) encoding the sequence of video pictures using the determined number of B-video pictures.

53. (New) The computer readable medium of claim 52, wherein the set of instructions for determining the number of B-video pictures comprises sets of instructions for:

a) computing at least one motion vector for at least one video picture in the sequence of video pictures;

b) computing a cost value for at least one computed motion vector; and

c) determining whether the cost value is greater than a threshold value to determine the number of B-video pictures.

54. (New) A computer readable medium storing a computer program for processing a sequence of video pictures, the computer program executable by at least one processor, the computer program comprising sets of instructions for:

a) encoding a plurality of video pictures as unidirectional motion compensated (P) video pictures;

b) determining a number of B-video pictures for the sequence of video pictures based on a cost value associated with the P-video pictures; and

c) encoding the sequence of video pictures using the determined number of B-video pictures.

55. (New) The computer readable medium of claim 54, wherein the set of instructions for determining the number of B-video pictures comprises a set of instructions for determining whether the cost value is greater than a threshold value, wherein when the cost value is greater than a threshold value, the number of B-video pictures is the number of video pictures between the particular video picture and a reference video picture.

56. (New) A computer readable medium storing a computer program that is executable by at least one processor, the computer program comprising sets of instructions for:

a) determining a relationship between a motion vector cost value for a first video picture and a motion vector cost value for a second video picture; and

b) determining whether there is a scene cut between the first video picture and the second video picture based on the relationship.

57. (New) The computer readable medium of claim 56, wherein the set of instructions for determining whether there is the scene cut comprises a set of instructions for determining whether the relationship is less than a predetermined threshold value.